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Confined Livestock Feeding Facilites: Control of Stable Flies and Hosue Flies

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Control of Stable Flies and House Flies

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Stable flies and house flies are major pests near confined livestock facilities, cattle feedlots, and dairies, and cost livestock producers millions of dollars annually, especially in the more humid environment of eastern South Dakota.

Losses result from decreased weight gains and production by cattle that suffer the attack of the stable fly. Economic losses due to the house fly are much more difficult to determine, but nevertheless they are a nuisance to livestock and people.

A problem is emerging with these two flies, especially the house fly. As urban development gradually spreads into what were traditionally agriculture production areas, the distance closes between rural residents and livestock operations. Flies move to town. Soon "nuisance lawsuits" citing livestock feeding facilities and dairies for "dust, odor, and flies" will be requesting punitive damages or, worse yet, the closing of livestock feeding facilities and dairies.

In recent years stable flies have also become a problem with pasture cattle in eastern South Dakota. The problem worses because traditional fly control methods used for horn flies and face flies do not work on stable flies and house flies.

Economic importance of stable and house fly control

Weight gain reductions of 13.2% with fly populations of 50 stable flies per calf and a 20% reduction with fly populations of 100 flies per animal have been reported in Nebraska research (Campbell 1977). Screens excluded flies from some pens while controlling their numbers in other pens for the duration of the fly season (17 weeks from June to September).

Weight gain and production continue to decline as stable fly numbers increase, but the reduction in feed efficiency tends to plateau at levels of about 12 stable flies per front leg.

Catangui et al. (1997) calculated the reduction in average daily gain of feeder heifers caused by stable flies, using the market price of the heifers and the per cent reduction in gain. Estimates were than used to calculate the economic injury level as flies/leg/minute increased. Data generated over 17 years varied in the level of fly

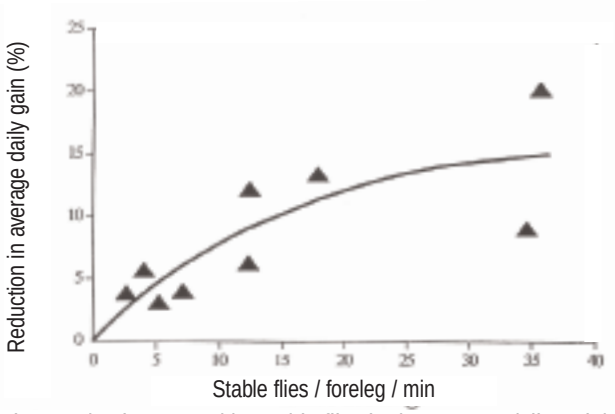

Fig 1.Reduction caused by stable flies in the average daily weight gain of feeder heifers. Source: Catangui et al. 1997.

numbers, heifer numbers, the weather, the management and care of the heifers, the ration (growing or finishing diets) and the number of days on feed. Reduction in average daily gain in these studies averaged 8.46% (range 2.9% to 20%).

As stable flies/leg numbers increased, average daily weight gain would decrease but only up to a point. The maximum reduction in average daily weight gain is predicted to be 16.7%. At a certain point, increased fly numbers will not cause the same significant change in weight gains.

One reason for this is that stable flies tend to feed primarily between 10 a.m. and 4 p.m., with no or very little activity between dusk and early morning. Thus, regardless of how numerous the flies, feeder cattle have ample time to eat undisturbed. Another possibility is that animals become desensitized to the painful bite of the stable fly once a certain fly population level is reached.

Cattle react to stable fly attack by bunching. When bunching occurs in cattle that are already heat-stressed, losses due to fly attack will be magnified.

The upper limit of the thermo-neutral zone in cattle is about 80ºF. Above this, cattle must expend energy to dissipate heat (panting), thereby reducing efficiency. Bunching reduces weight gains even further; thus reduced weight gains in feedlot cattle is a result of two stressors—heat and flies. If the period of heat stress extends the time required to finish cattle the result would be an increase in the costs of production.

It is difficult to put an exact dollar figure on the losses to South Dakota's livestock feeding and dairy operations resulting from stable flies. However, it is suspected to be a very substantial amount.

The cost attributed to house flies in confined livestock facilities is even harder to determine. Nebraska research shows that there were no significant differences in weight gains between cattle pens of cattle that excluded house flies and pens of cattle with an average of 49 house flies per animal. However, the scientists saw that when house fly numbers at feed bunks increased, cattle seemed to hesitate to come to the bunk to eat.

It is believed when neighbors of feedlot operations complain about flies; the house fly is most often the culprit. There is no means to attach an economic value to this, though it is estimated to be substantial.

Adult stable and house fly identification and feeding habits

The house fly and the stable fly are very similar in size and appearance. However, they can be easily differentiated by their mouthparts. The stable fly's mouthparts project straight forward from under the head (bayonet-type) while the house fly has a sponging-sucking type mouthpart. The stable fly also has dark spots on the top of its abdomen (its back).

Their feeding habits and behavior are quite different. House flies do not bite, but rather sponge up their food from living animals (blood from wounds, saliva, and eye secretions), carcasses of dead animals, or from organic wastes. Such a diet can provide the means to contract and transmit disease organisms.

The stable fly "bites" and, in fact, both sexes require a blood meal to reach sexual maturity. The mouthpart is used to lacerate the skin during the biting process. The bite is likened to a combination of jackhammering and sawing.

Numerous animal species serve as hosts but cattle, horses, and dogs seem to be preferred. Laboratory tests have found blood from humans, deer, chickens, rabbits, sheep, and swine in the gut of the stable fly. A stable fly feeds on the tops of the ears of dogs, the front legs of other animals, or on the ankles of humans, feeding until it is engorged. Then it moves to a resting place (usually shade in hot weather) to digest the blood meal.

Stable flies feed from one to three times per day depending on the climatic conditions. Maximum feeding occurs usually about midday. Increased temperature and decreased relative humidity and/or wind with radiation (drying conditions) decreases feeding activity.

Stable fly populations generally peak in early summer (mid-June to mid-July). Monitoring adult stable fly populations generally consists of counting the number of flies feeding on one side of the front legs. Other monitoring methods include alsynite traps, adhesive-coated traps, baited jug-traps, and liquid pheromone traps.

Life cycle and breeding habits of stable and house flies

Life cycles of the two species are similar, consisting of eggs, larvae (maggots), pupae, and adults. The generation interval for stable flies is about 3 weeks in summer, compared to about 2 weeks for the house fly.

Both species have high breeding capability. The females of both species can deposit 500 or more eggs in a life span. In more temperate areas the house fly will gradually outnumber the stable fly as the season progresses. This is because of differences in life span, species competitiveness, and temperature differences.

Environmental factors in feedlot pens—moisture, temperature, organic matter, pH—were determined in areas of feedlot pens where immature forms of the stable fly were found (Campbell and Rasmussen 1981). Flies

could develop in areas with a rather wide range of environmental conditions; however, most immature forms were found in substrate with a moisture content of 52% (range 22 to 65%), average organic matter of 35% (range 21 to 52%), and an average pH of 7.7 (range 7.1 to 8.2). Average temperature where most larvae were located was 74.4º F (range 70 to 77.5º F). Fly breeding media (soil and organic matter mixture) within a feedlot varies from a minimum depth of 3.9 inches to more than 11.8 inches. If it were divided into thirds (top, middle, and bottom), most of the immature flies were located in the middle layer followed by the top third and then the bottom third.

Feedlots were divided into subsystems consisting of silage storage, feed bunks, fence lines and gates, pen areas, and drainage areas to determine fly breeding areas in each subdivision (Gilbertson and Campbell 1986). In all, over 50,000 sites in 93 feedlots were searched in this 2-year study, All subsystems contained a considerable number of flies.

In a similar 4-year study found that the majority of immature stable flies (62.5%) were found along feeding aprons, 24.6 % around mounds, and 8.4 % along side fences (Skoda 1992; Skoda et al. 1991, 1993, 1996) . Favorable moisture content and a high amount of organic matter were the most important factors relating to numbers of immature flies found.

Facility management, sanitation, and manure handling

These studies indicate that good sanitation practices are a must to reduce fly breeding areas around feedlots and dairies. Immature flies were found almost everywhere; around silage spills, potholes, gates, fence lines, mounds, silage piles and especially along feeding aprons.

House flies may occasionally deposit eggs in fresh manure but they prefer, and stable flies require, a moist manure-and-soil or organic matter-and-soil mixture 4 inches to a foot deep.

This mixture does not get 4 inches deep overnight. It does require the foot action of cattle to mix their manure with the soil. So keeping all lots scraped and cleaned regularly is an extremely important management practice.

Areas behind feeding aprons, around water troughs, potholes, and along fence lines tend to get a lot of foot traffic, catch a lot of manure, and become low, wet areas. Because they are lower than the rest of the lot, these areas tend to catch a large amount of run-off after each rain, making them ideal sites for flies to deposit their eggs. This is why low areas need to be scraped out and filled with fresh dirt regularly.

Other problem areas include drainage areas within pens and channel areas behind pens where water moves to the holding lagoons, spilled feed along feedbunks or wet feed in the feed storage areas, leaky water fountains, drainage along silage piles, the edges of manure storage piles (unless covered with black plastic), sick pen hay or straw bedding, any place where old hay or spilled feed or manure accumulates.

These areas and all pens need to be cleaned completely every spring and at bi-weekly intervals throughout the summer. Manure should either be spread on the land to dry out or be piled and covered with plastic traps for later disposal.

Chemical control

A number of chemicals and application methods have been used to control stable and house flies while feeding upon host animals, most with limited success. Wet sprays applied to the animal, usually with a mist blower, may reduce stable fly numbers by 75% on day one after treatment, but control will drop to less than 50% by the fourth day and may not be evident by the seventh. .

Stable flies prefer to feed on the front legs of cattle. When spraying a group of animals getting a good cover on the legs is very difficult. Cattle also have the habit of walking through water and wet vegetation, which quickly wash off the insecticide.

Dust bags, oilers, and insecticide-impregnated ear tags are even less effective for the control of stable and house flies because these self-treatment devices fail to deposit the required amount of insecticide on the cattle's legs.

Baits may be useful around the office or feedmill but are only effective on house flies and would not be of much help in overall control as fly populations are just too high in the lots.

Oral larvicides that are incorporated into the feed and pass through the animal's digestive track and into the manure are also relatively ineffective in controlling stable and house flies. They are of some benefit in more arid regions because house flies will deposit eggs in fresh manure. Stable flies, however, will only lay eggs in moist, non-compacted manure-dirt mixtures or spilled feed. The toxic effects of the oral larvicide are lost by the time the manure-dirt mixture is suitable for stable fly and most house fly breeding.

When used as part of IPM program, residual insecticides can be very effective on fly resting areas. These insecticides will remain effective for 10 days or longer if not exposed to UV light or washed off with rain. They are useful when applied to sides of buildings or fly resting areas around the office or feed handling facilities. House flies seek shelter at night on inside walls of open buildings or under eaves of the outside buildings. If these areas can be located, residual sprays can be quite effective.

Understanding some of the habits of flies will improve control. It is well known that after stable flies obtain a blood meal they seek a shaded area to digest their meal. Shady sides of buildings, shady sides of windbreaks near the lots, or shady sides of feedbunks may have high numbers of flies resting on them during the hot part of the day. Spraying these areas when flies are resting there can be quite effective in reducing fly numbers.

In some cases, crops planted close to holding pens, especially corn, can also provide shade and should be treated with insecticides. If these fly resting areas can be located, treating them with residual sprays can be an important part of your fly control program.

Insecticides should be used on the day they are mixed because they will lose effectiveness over time. A general recommendation is to rotate insecticides; for example, use an organophosphate one time and on the next application rotate to a pyrethroid-based one.

Some residual insecticides will require removing animals from the buildings while the spray is applied. Also, some residual sprays have restrictions on treating the inside of buildings, treating animals under a certain age, or being used around lactating dairy animals. **Always follow label instructions**.

Biological control

A great deal of research has been directed toward biological control of the stable and the house fly, most of it with pteromalid wasps (Hymenoptera: Pteromalidae). These wasps are parasitic on dung-inhabiting fly pupae. The female wasp inserts its ovipositor into the pupal case of the fly and deposits one or more eggs. This action is termed a "sting." The wasp larvae feed on the developing fly and destroy it.

Several species of pteromalid wasps are produced and sold by commercial insectaries for control of feedlot filth flies; however, these species often are not native to the release area and winter survival is questionable. It is believed, however, that biological control can be effective if used as a part of a whole IPM program of sanitation, weed control, insecticides, etc.

Integrated pest management approach

The failure to bring about anything but a temporary reduction in fly populations has led researchers to believe that an integrated approach for control is the best way to combat the problem.

Good management and sanitation practices should be the first and most important component of an integrated approach of fly control for feedlots and dairies. Relying on insecticides or pteromalid wasps alone is temporary and costly. An integrated approach incorporates animal management, sanitation, manure management, facility design, biological control, and finally, judicious use of pesticides.

A good feedlot manager always plans ahead. When facilities are being built or expanded, good drainage and ease of manure management should be a major part of the plan. Areas where moisture accumulates within holding pens often become sites for fly breeding. The initial design and construction stage is the best time to eliminate these areas.

Stable flies and house flies on pasture cattle

Historically, stable flies and house flies have been considered pests only in confinement facilities, but in recent years they have been found to be an important problem in pasture cattle. In fact, the economic impact to cattle on pasture is about equal to that of confined cattle.

This has probably always been the case in wetter areas of South Dakota, but no one recognized the problem until the last few years when producers noticed that their fly control program wasn't working. Producers treated cattle using the latest fly control methods and cattle were still bunching and stomping, trying to fight off flies.

Most cow/calf producers use insecticide impregnated ear tags, oilers, and dust bags. These methods of applying insecticide work for horn flies and face flies, which for the most part feed on the face and back of the animal. Systemic pour-on and spot-on products are applied on the backs of cattle. The insecticides give better control where the insecticide is more concentrated. Thus, even though these products are systemic they give much better control for back feeding flies than leg feeding stable flies.

Products administered as sprays or mists can give some control of stable flies. However, the front legs are where most stable flies feed, and it is much harder to spray cattle legs than backs. Cattle tend to walk through water and wet vegetation, which will also quickly wash or wear off the insecticide from the front legs.

Another problem with sprays and mists is that the products, even though residual, have a maximum protection of only a couple of weeks.

Yet another problem is that cattle on pasture are often in rough and hilly country with trees, creeks, and ditches. Treatment with a sprayer or mister would be very difficult if not impossible once the cattle are out on grass. Treatment at spring turn-out also has its problems: first, because of the short duration of time the insecticide controls flies and second, because the peak season for stable and house flies is not until mid summer.

The integrated approach to pest management will also be the best for control of house and stable flies in pasture cattle. The cow/calf producer must incorporate animal management, sanitation, manure management, and the wise use of insecticides. However, all livestock producers need to be involved, because of the close proximity of farms, pastures, feedlots and dairies in eastern South Dakota and because stable flies and house flies move around more than previously thought. Manure management and good sanitations practices need to be part of all livestock producers' control programs.

We have come a long way in understanding stable flies and house flies. Extensive research and study of these flies has given us new insight on how to deal with them.

A fly is not just a fly, and the method of controlling one species will not necessarily work on another. Despite the accomplishments and the research we have only solved part of the problem. We have yet to come up with the ideal control for these flies in pasture situations. Their movement into urban areas as a result of towns growing out into agricultural production areas must also be addressed.

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